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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/699,188	10/27/2000	James H. Parry	21706-05327	6572

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EXAMINER	
JAMAL, ALEXANDER	

ART UNIT	PAPER NUMBER
2643	

DATE MAILED: 09/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/699,188	PARRY, JAMES H.	
	Examiner	Art Unit	
	Alexander Jamal	2643	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 June 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-52* is/are pending in the application.

4a) Of the above claim(s) *46* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-45 and 47-52* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendments

1. Based upon amendments received 6-22-2004, examiner notes that claim 46 has been cancelled and claim 52 has been added.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. **Claims 1-34** rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claims 1 and 22 claim a distortion module that models the distortion of a first audio signal to create a distorted signal, and then passes that distorted signal to an adder module that is adapted to use (subtract) said distorted signal to remove part of the echo from a second audio signal. The applicant's specification states that the adder module receives a signal that is an estimate of the echo (including any distortions from the loudspeaker or microphone) and uses that signal to remove at least part of the echo of the second signal. The adder module (as per the specification) does not receive a distorted version of the first signal, but an estimate of the echo of the first signal (including loudspeaker distortion) (specification page 9 lines 14-22).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. **Claims 35-52** rejected under 35 U.S.C. 103(a) as being unpatentable over Chu (5263019), and further in view of Ngia et al. ('Non-linear acoustic echo cancellation using a hammerstein model'), and further in view of Kaizer et al. (4709391).

As per **claim 35,** Chu discloses a terminal for an audio communications system comprising a first input for receiving a first audio signal shown as S(z) and being input to output-signal-conditioner 33 and loudspeaker 32(Fig. 1). The system further comprises a second input for receiving a second audio signal from microphone 10 (Fig. 1). Wherein a portion of the second audio signal includes an echo from the first audio signal (transmitted through speaker 32) (Col 1 lines 15-27). The system further comprises an adder module 54 (Fig. 3) is used to subtract the echo estimation of the first audio signal from the second audio signal in order to remove at least part of the echo from the second audio signal (Col 7 line 64 to Col 8 line 15). However, Chu does not mention a distortion module that receives the first audio signal and models a distortion on the first audio signal to produce a distorted signal to which the adder module is responsive. Chu also does not specify implementing an audio sensing module (comprising multiple distortion

modules that each implement a separate type of distortion) to model the non-linear distortions on the second signal received by the microphone.

Ngia teaches that loudspeaker non-linearities limit the ability of the standard linear filter to approximate the actual echo signal received in an acoustic echo canceller (Page 1229, Col 2). He teaches the use of a neural net (page 1230, Col 2) (that comprises distortion modules) to model various non-linear loudspeaker distortions. This process, along with an FIR filter to model the linear dynamic portion (echo) produce the improved echo estimate that is sent to an adder to subtract the improved echo estimate from the incoming (second) signal (Fig. 1). It would have been obvious to one of ordinary skill in the art at the time of this application to provide distortion modules that take into account the non-linear distortion of the loudspeaker for the purpose of improving the accuracy of the estimated echo.

Kaizer teaches that both electroacoustic (loudspeakers) and acoustoelectric (microphones) (ABSTRACT) may be modeled with a non-linear network comprising multiple distortion modules (each one modeling a different distortion transfer function) (Col 12 line 13 to Col 13 line 13). He teaches that the model structure will may be used in systems to help reduce the distortion inherent to the transducers (both microphones and loudspeakers and take into account any amplifier clipping (Col 1 lines 33-60). It would have been obvious to one of ordinary skill in the art at the time of this application that the microphone (and any associated amplifiers) could be modeled for the non-linear distortions, and those distortions used in the echo canceller structure in addition to

modeling the loudspeaker distortions for the purpose of further reducing the non-linear distortions in the system.

As per **claims 47-48,50-52,** claims rejected for the same reasons as the claim 35 rejection.

As per **claim 36,** Chu's system is implemented digitally (Col 3 lines 44-47). As such the first and second audio signals would inherently bear sequencing information that would be used by all parts of the system (including the adder module) for the purpose of synchronizing the input audio signals with the echo estimation signal.

As per **claim 37,** Ngia discloses the use of an audio generation module (the echo canceller in Fig. 1) that uses a neural net with an FIR filter to implement distortion modules that model the non-linear distortions caused by playing the first signal U(t) through a loudspeaker (pages 1229-1230).

As per **claims 38/39,** Ngia's audio distortion module comprises multiple distortion modules (Page 1230 Cols 2) that each model a different type of distortion on first signal U(t) (Page 1230 Col 1).

As per **claim 40,** Chu's system operates in a standard communication system (Col 1 lines 15-25), as such any distortion modules taught by Ngia must inherently alter the modeling path with real-time responsiveness for the purpose of allowing standard, real-time communication to occur between users of Chu's system.

As per **claims 41-44,** Ngia discloses the use of a Hammerstein model that models all the non-linear distortions of playing a signal through a loudspeaker based upon actual data collected in an anechoic chamber (page 1230 Col 1) (Page 1231 Cols 1,2). Because it is based upon actual experimental results, the modules would inherently model amplifier clipping on the first audio signal, voice coil displacement on sound waves produced by the loudspeaker hysteresis in iron inductors on the first audio signal harmonic distortion on sound waves produced by the loudspeaker

As per **claim 45,** Ngia teaches the use of an FIR filter to model the linear changes in the second audio signal (d(t) in Fig. 1) (Pages 1229-1230) based upon the acoustic echo of the first signal.

As per **claim 49,** Chu's system operates in a standard communication system (Col 1 lines 15-25), as such any distortion modules taught by Ngia or Kaizer must inherently alter the modeling path with real-time responsiveness for the purpose of allowing standard, real-time communication to occur between users of Chu's system.

Response to Arguments

6. Applicant's arguments filed 6-1-2004 have been fully considered but they are not persuasive.

As per the argument regarding the 112 First paragraph rejection of claim 1 and 22 (page 10 in applicant's Remarks), the applicant refers to Figure 2, module 232 as the distortion module that creates a distorted signal that is sent to the adder 220. However, the distorted signal must be sent to modules 234 and 236 as well. These modules will

further produce an echo estimate of the distorted signal output by module 232. It is the echo estimate of the distorted signal that is passed to adder 220, not the distorted signal. If only the distorted signal is sent to the adder, then the device would not function properly.

As per the argument regarding the 103 rejection to the amended claim 35, the examiner relies upon Ngia to teach the concept of accounting for non-linear distortions in echo cancellers due to the non-linear loudspeaker characteristics. Kaizer is relied upon to teach that sensing signals (via microphones) also produces non-linear distortion that can be used in systems to help reduce the distortion. Chu's system in view of Ngia would take the loudspeaker distortion into account. Chu and Ngia's system in view of Kaizer's teachings would also take the microphone distortion into account.

Conclusion:

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexander Jamal whose telephone number is 703-305-3433. The examiner can normally be reached on M-F 8AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Curtis A Kuntz can be reached on 703-305-4708. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9306 for regular communications and 703-872-9315 for After Final communications.

CURTIS KUNTZ
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600

AJ
September 20, 2004